

6.1.3 MEASUREMENT

Water-quality sampling should include an air-temperature measurement and a water-temperature measurement. Before measuring temperature:

- ▶ Inspect liquid-in-glass thermometers to be certain liquid columns have not separated.
- ▶ Inspect bulbs to be sure they are clean.
- ▶ Inspect protective cases to be sure they are free of sand or debris.

6.1.3.A AIR

Read air temperature with a dry, calibrated thermometer.

- ▶ Place the thermometer about 5 ft above the ground in a shaded area protected from strong winds but open to air circulation. Avoid areas of possible radiant heat effects, such as metal walls, rock exposures, or sides of vehicles.
- ▶ Allow 3 to 5 minutes for the thermometer to equilibrate, then record the temperature and time of day.
- ▶ Measure the air temperature as close as possible to the time when the water temperature is measured.
- ▶ Report routine air temperature measurements to the nearest 0.5°C. If greater accuracy is required, use a thermistor thermometer that has been calibrated to the accuracy needed.

SURFACE WATER 6.1.3.B

The reported surface-water temperature must be measured in situ—**do not measure temperature on subsamples** from a sample compositing device. Measure temperature in such a manner that the mean or median temperature at the time of observation is represented (consult NFM 6.0 and fig. 6.0–1). Record any deviation from this convention in the data base and report it with the published data.

To measure the temperature of surface water:

- ▶ Make a cross-sectional temperature profile to determine temperature variability—A thermistor thermometer works best for this purpose.
 - ▶ Determine from the cross-sectional profile and from study objectives which sampling method to use (see NFM 6.0).
 - ▶ Measure temperature in those sections of the stream that represent most of the water flowing in a reach. Do not make temperature measurements in or directly below stream sections with turbulent flow or from the stream bank (unless this represents the condition to be monitored).
1. Use either a liquid-in-glass thermometer tagged as “District certified” within the past 12 months, or a thermistor thermometer tagged “District certified” within the past 4 months.
 2. Record on field forms the temperature variation from the cross-sectional profile, and the sampling method selected.
 - **Flowing, shallow stream**—wade to the location(s) where temperature is to be measured. To prevent erroneous readings caused by direct solar radiation, stand so that a shadow is cast on the site for temperature measurement.
 - **Stream too deep or swift to wade**—measure temperature by lowering from a bridge, cableway, or boat a thermistor thermometer attached to a weighted cable. Do not attach a weight to the sensor or sensor cable.
 - **Still-water conditions**—measure temperature at multiple depths at several points in the cross section.

3. Immerse the sensor in the water to the correct depth and hold it there for no less than 60 seconds until the sensor equilibrates thermally. The sensor must be immersed properly while reading the temperature; this might require attaching the thermistor to a weighted cable.

TECHNICAL NOTE: For in situ measurement with liquid-filled thermometers—the water depth must be no greater than twice the length of the liquid column of the thermometer in order to make an accurate measurement.

4. Read the temperature to the nearest 0.5°C (0.2°C for thermistor readings)—**do not remove the sensor from the water.**
 - Using a liquid-in-glass thermometer, check the reading three times and record on field forms the median of these values.
 - Using a thermistor thermometer, wait until the readings stabilize to within 0.2°C, then record the median of approximately the last 5 values.
5. Remove the temperature sensor from the water, rinse it thoroughly with deionized water, and store it.
6. Record the stream temperature on field forms:
 - **In still water—median** of three or more sequential values.
 - **EDI—mean** value of subsections measured (use median if measuring one vertical at the centroid of flow).
 - **EWI—mean or median** value of subsections measured.

GROUND WATER 6.1.3.C

Measurements of ground-water temperature must be made downhole at the end of purging for temperature to represent aquifer conditions (consult NFM 6.0 for guidance).

To measure the temperature of ground water:

- ▶ Select either the downhole or flowthrough-chamber sampling system of measurement (see NFM 6.0, fig. 6.0–4) and record on field forms. **Do not report a temperature value measured from a bailed sample.**
 - ▶ Measure temperature with a thermometer that has been District certified and is calibrated within the temperature range to be encountered.
1. Prepare the instruments for either the downhole or the flowthrough-chamber system.
 - **Downhole system**—lower the sensor in the well to just below the pump intake (the intake location depends on the sampling objectives).
 - **Flowthrough-chamber system**—properly immerse the thermistor or liquid-in-glass thermometer in the chamber. Keep the tubing from the well to the chamber as short as possible, out of direct sunlight, and off the ground.
 2. Begin water withdrawal from the well.
 3. Allow the thermometer sensor to equilibrate with the well water for 5 minutes; record the readings and time intervals throughout the period of purging.
 4. Toward the end of purging, record five measurements, spaced at increments of 3 to 5 minutes or more.
 - If the thermistor temperature is stable within the 0.2°C criterion (for a liquid-in-glass thermometer, there should be only slight fluctuation within the 0.5°C interval), report the median of the final five measurements (table 6.0–1).
 - If the stability criterion has not been met, extend the purge time and consult the well-purging objectives of the study. Report the median of the last five (or more) sequential measurements and record any instability on field forms.
 5. Remove and clean the temperature sensors.